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GEORGIA INSTITUTE OF TECHNOLOGY
OFFICE OF RESEARCH ADMINISTRATION

RESEARCH PROJECT INITIATION

Date: 18 January 1973

Project Title: "Solid Waste Technology"

Project No: E-20-519

Principal Investigator Dr. F. G. Pohland

Sponsor: Environmental Protection Agency

Agreement Period: From July 1, 1972 Until June 30, 1973

Type Agreement: Grant No. T-900227 (Formerly T01 EP 00033)

Amount: $33,038

Reports Required: Quarterly Progress Reports
Progress Report (with renewal proposal)
Final Report

Sponsor Contact Person (s):

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Assigned to: School of Civil Engineering

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RA-3 (6-71)

GEORGIA INSTITUTE OF TECHNOLOGY
OFFICE OF CONTRACT ADMINISTRATION

SPONSORED PROJECT TERMINATION

Date: March 22, 1977

Project Title: Solid Waste Technology

Project No: E-20-519

Project Director: Dr. F. G. Pohland

Sponsor: Environmental Protection Agency

Effective Termination Date: 6/30/76

Clearance of Accounting Charges: 6/30/76

Grant/Contract Closeout Actions Remaining:

- _ Final Invoice and Closing Documents
- X Final Fiscal Report
- _ Final Report of Inventions
- _ Govt. Property Inventory & Related Certificate
- _ Classified Material Certificate
- _ Other _____

Assigned to: Civil Engineering (School/Laboratory)

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Project Code (GTRI)
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CA-4 (3/76)

QUARTERLY PROGRESS REPORT 1

Training Project Number T-9002227

"Solid Waste Technology"
July 1, 1972 - October 1, 1972
Georgia Institute of Technology
Atlanta, Georgia

General

The new grant period as authorized in September 1972 commenced on July 1, 1972 at the beginning of the summer quarter. The summer quarter is normally devoted to completion of student research, special problems and remaining course work to fulfill requirements for the masters degree for students initiating their programs in the fall quarter and completing them in a 12-month period. Specific course work in solid waste technology is not presented until the winter and spring quarters so that students have been and are presently engaged in supporting activities and continuation of previously initiated projects. The late notification of traineeship support has adversely affected student recruitment and participation on the program during the current academic year.

Program Description

The program provides specialized interdisciplinary graduate training in the technology of solid waste characterization, collection, transport and disposal with special emphasis on pertinent operations and processes, systems analysis and management. This effort is accomplished by a flexible core curriculum in solid waste technology, by suggested graduate curricula in the contributing disciplines, and by seminars and field problems. Students enrolled in the program during this project period as trainees have received or are working toward the M.S. in Sanitary Engineering with formal courses in Environmental Chemistry and Microbiology, Processes and Design, Solid Waste Technology, Management, Statistics and Computer Technology. In addition, each student is required to participate in seminars and prepare either a thesis or special problem report on solid waste technology.

Topics which have been chosen by trainees for special problmes or research include:

"Anaerobic Treatment of Livestock Waste"
"The Effect of Household Compacted Refuse on Solid Waste Disposal Practices"*
"Feasibility of Developing Sanitary Landfills at Abandoned Surface Mines in Georgia"*
"Landfill Stabilization with Leachate Recirculation, Neutralization and Sludge Seeding" (Supported also by EPA research grant R-801397)

"Alternatives for Biological and Chemical Treatment of Leachate from Landfill Disposal Sites"
"Solid Waste Collection and Disposal Alternatives for the Brighton and Big Cypress Seminole Indian Reservations"

In addition to these projects, several new students are developing their research plans and are engaged in courses in air pollution, microbiology, chemistry, urban planning and seminar activities. It is likely that additional special problems on compacted refuse treatment, solid waste transport management and leachate treatment will be the focus of student activities during the present project period. Reports on listed projects as indicated previously with an asterisk have been submitted to the granting agency. Similar reports are now in preparation.

Trainee Participation and Accomplishments

There have been six graduate trainees in Sanitary Engineering specializing in Solid Waste Technology during the period covered by this report. One of these is a new trainee who commenced his program in September 1972, three have received the M.S. in Sanitary Engineering and two students are completing their programs within the near future.

	Degree Date	Employer
Charles R. Breland	MSSE - Dec. '72	State of Georgia Envir. Protection Div. Solid Waste Section
John F. Madajewski	MSSE - Sept. '72	Disko Assoc. Solid Waste Engineer West Orange, N.J.
Frank C. Mingledorff, Jr.	MSSE - Sept. '73	---
Larry J. Picciola	MSSE - Sept. '72	Picciola and Assoc. Solid Waste Engineer Galliano, La.
John R. Rist	MSSE - Sept. '72	State of Georgia Envir. Protection Div. Water Quality Section
Gary L. Sweenhart	MSSE - Dec. '72	Eco-Science Labs, Inc. Managing Engineer Atlanta, Georgia

Through their courses, special problems and research activities, all trainees participate in solid waste laboratory and field projects. The normal course load is 15 hours per student per quarter and four other stu-

dents are presently directly involved in these solid waste oriented activities. Twenty five (25) graduate students are normally enrolled in Sanitary Engineering during any one quarter.

The program director has been involved in several community projects including the development and review of the new solid waste regualtions for the State of Georgia, a solid waste committee for the Engineers Concerned for Quality Environment Council, and the EPA-Whirlpool-State of Georgia demonstration project on the household (Trash Masher) compactor. In addition several student projects in other disciplines have been advised and current discussions are being scheduled for local jurisdictions in connection with solid waste systems development and in anticipation of student field problems. The program director also serves as a consultant to the EPA solid waste program for demonstration grants.

Administrative Actions

Staff assignments and activities associated with the training program in Solid Waste Technology have been consistent with the schedule described herein and in the grant proposal and award statement. Unfortunately, the uncertainty of support for this fiscal year hindered the active recruitment of students and scheduling of additional staff participation in the program. This led to a search for other support and an increase in institutional commitment. Some success has been achieved in the form of a Whirlpool Fellowship for a student in Solid Waste Technology and a guarantee from the administration for continued growth and emphasis in the area. Even with the late receipt of support from EPA, one student trainee has been appointed, several additional students have expressed interest in the program and recruitment has been accelerated for succeeding quarters.

The initial course in solid wastes (Solid Waste Technology I) scheduled for the winter quarter will be updated and planning for several solid waste field projects has been initiated. The spring quarter course (Solid Waste Technology II) will be strengthened by the participation of a mechanical engineer (Mr. Keng) from the Engineering Experiment Station at Georgia Tech; an authority on incinerator analysis and design. With the continually emerging interest in the environment by students, additional ways and means of coordinating efforts and encouraging student involvement in solid waste technology will be sought.

There appears to be a real student interest in the field and no difficulty has been experienced to date in placing graduates from Georgia Tech in positions requiring such expertise. It is hoped that the federal support policy will become more stable and permit the continued support of both programs and students in this vital area of environmental quality control.

Frederick G. Pohland
Professor of Civil Engineering
Program Director

E-20-317

QUARTERLY PROGRESS REPORT 2

Training Project Number T-9002227

"Solid Waste Technology"

October 1, 1972 - December 31, 1972
Georgia Institute of Technology
Atlanta, Georgia

General

This report covers the second quarter of the project period which commenced on July 1, 1972 at the beginning of the summer quarter at Georgia Tech. It coincides with a 10-week fall quarter covering a period of September through December. Although formalized course work in solid waste technology was not presented during this period, students engaged in supporting courses and preliminary planning for special problems and research.

Program Description

As detailed in the grant application, the program provides specialized interdisciplinary graduate training in the technology of solid waste characterization, collection, transport and disposal with special emphasis on pertinent operations and processes, systems analysis and management. The effort is accomplished by a flexible core curriculum in solid waste technology, by suggested graduate curricula in the contributing disciplines and by seminars and field problems. Students presently enrolled in the program as trainees are working toward the M.S. in Sanitary Engineering with formal courses in Environmental Chemistry and Microbiology, Processes and Design, Solid Waste Technology, Management, Statistics and Computer Technology. In addition, each student is required to participate in seminars and prepare a thesis or special problem report on a solid waste topic.

Topics that have been chosen by students participating in the program include:

"Feasibility of Contained Stabilization of Compacted Refuse in Natural and Saline Environments"

"Sanitary Landfill Stabilization with Leachate Recycle" (Supported also by EPA Grant No. R-801397)

"A Study of Solid Waste Management Practices at a College Campus"

"The Analysis, Characterization and Treatment of Leachate from Solid Waste Disposal Sites"

In addition, two reports have been made available during this project period including:

"Treatment of Leachate from Sanitary Landfills"

"Landfill Stabilization with Leachate Recirculation, Neutralization, and Sludge Seeding"

Trainee Participation and Accomplishments

Because of late receipt of approval and funds for continuation of the training grant (September 1972), recruitment of trainees for the program suffered and only two new trainees have been appointed during this grant period. However, a total of about 25 graduate students in the Sanitary Engineering program at Georgia Tech, 15 have expressed some interest in Solid Waste Technology and another 3 students have now enrolled in the first solid waste course from other departments (Mathematics, City Planning and Industrial and Systems Engineering). The following trainees participating in the program during this report period:

	Degree - Date	Employer
Charles R. Breland	MSSE - Dec. '72	Ga. Envir. Protection Div., Solid Waste Section
Frank C. Mingledorff, Jr.	MSSE - Sept. ' 73	---
Gary L. Sweenhart	MSSE - Mar. '73	Eco-Science Labs, Inc. Atlanta, Georgia

In addition, Mr. Mark C. Boner will commence his program as a trainee in January 1973.

Through their courses, special problems and thesis research, all trainees participate in solid waste laboratory and field projects. The normal course load is 15 hours per student per quarter.

The program director has been involved in several community and university projects including a special committee on solid wastes of the Engineers Concerned for Quality Environment Council, an EPA - Whirlpool - State of Georgia demonstration project on the household (Trash Masher) compactor and an Environmental Engineering Committee (chairman) of the College of Engineering concerned with development of multi-disciplinary specialty training areas, including solid waste technology, in environmental engineering. A paper on some of the research on landfill stabilization with leachate recycle will be presented at the Third Annual Environmental Engineering and Science Conference at Louisville, Ky. in March 1973 and an abstract on leachate treatment alternatives has

been submitted for the Purdue Industrial Waste Conference in May 1973. The program director also serves as a consultant to EPA on solid waste demonstration grants.

Administrative Actions

Staff assignments and activities associated with the training program in Solid Waste Technology have been consistent with the schedule described in the project proposal. Unfortunately, the uncertainty of support for this fiscal year hindered active student recruitment efforts and the scheduling of additional staff participation in the program. This has led to a search for other support and an increase in institutional commitment. Some success has been achieved in the form of a Whirlpool Fellowship for a student in Solid Waste Technology and a guarantee from the administration for continued emphasis in the area.

The intial course in solid waste (Solid Waste Technology I) has been updated for presentation in the winter quarter to include a special field project on institutional solid waste management and the incorporation of some of the elements of collection practices from the EPA Training Course Manual on Solid Waste Collection. Plans for the second course (Solid Waste Technology II) in the spring quarter are now materializing to include special emphasis on incinerator design, air quality control and solid waste management regulations.

The program at Georgia Tech continues to grow despite the uncertainties associated with federal support policies. Much of this growth can be attributed to the support received to data and hopefully will be forthcoming in the future. Student interest remains strong and no difficulties have been experienced by graduates in attaining positions requiring such expertise.

Frederick G. Pohland
Professor of Civil Engineering
Program Director, Solid
Waste Technology

FGP:lb

QUARTERLY PROGRESS REPORT (3 & 4)

Training Project Number T-900227

"Solid Waste Technology"

January 1, 1973 - June 30, 1973

Georgia Institute of Technology
Atlanta, Georgia

General

This report covers the third and fourth quarters of the project period which commenced July 1, 1972 at the beginning of the summer quarter at Georgia Tech. It coincides with the winter and spring quarters covering a period of January through June. Two courses in solid waste technology were presented during these quarters and the students initiated their research projects.

Program Description

As detailed in the grant application, the program provides specialized interdisciplinary graduate training in the technology of solid waste characterization, collection, transport and disposal with special emphasis on pertinent operations and processes, systems analysis and management. The effort is accomplished by a flexible core curriculum in solid waste technology, by suggested graduate curricula in the contributing disciplines, and by seminars and field problems. Students enrolled in the program during this period have been working toward courses in Environmental Chemistry and Microbiology, Processes and Design, Solid Waste Technology, Management, Statistics and Computer Technology. In addition, students participated in seminars and engaged in special problem study.

Topics chosen by students participating in the program include:

"Feasibility of Contained Stabilization of Compacted Refuse in Natural and Saline Environments"

"Sanitary Landfill Stabilization with Leachate Recycle" (Supported also by EPA Grant No. R-801397)

"A Survey of Solid Waste Collection and Management Practices at the Georgia Institute of Technology"

"Physical-Chemical Treatment Alternatives for Leachate"

Trainee Participation and Accomplishments

Because of the late receipt of approval of funds for continuation of the training grant (September 1972), recruitment of trainees for the program suffered and only two new trainees were appointed. However, of a total of about 25 graduate students in Sanitary Engineering, 15 have expressed some interest in solid waste. The following trainees participated in the program during this report period:

Student	Degree - Date
Frank C. Mingledorff, Jr.	MSSE - Sept. '73
Mark C. Boner	MSSE - Dec. '73

Through their courses, special problems and thesis research, all trainees participate in solid waste laboratory and field projects. The normal course load is 15 hours per student per quarter and most students extend their graduate programs through 12 months.

The program director has been involved in several community and university projects including and EPA - Whirlpool - City of Atlanta demonstration project on the household (Trash Masher) compactor and an Environmental Engineering Committee (chairman) of the College of Engineering concerned with development of multidisciplinary specialty training areas in environmental engineering. A paper on some of the research on landfill stabilization with leachate recycle was presented at the Third Annual Environmental Engineering Conference at Louisville, Ky. in March. Additional presentations are scheduled at the annual WPCF meeting in Cleveland in October and at a special seminar at the University of Florida at Gainesville in November.

Administrative Actions

Staff assignments and activities associated with the training program in Solid Waste Technology have been consistent with the schedule described in the project proposal. Unfortunately, the uncertainty of support for this fiscal year hindered active student recruitment efforts and the scheduling of additional staff participation in the program. This has led to a search for other support and an increase in institutional commitment. Some success has been achieved in the form of a Whirlpool Fellowship for a student in Solid Waste Technology and an assurance from the administration for continued emphasis in the area.

The initial course in solid waste (Solid Waste Technology I) was updated during the winter quarter to accommodate a field project on institutional solid waste management and incorporation of some of the elements of collection practices from the EPA Training Course Manual on

Solid Waste Collection. The second course (Solid Waste Technology II) presented in the spring quarter included a special emphasis on incinerator design, air quality control and new solid waste management regulations.

The program at Georgia Tech continues to grow despite the uncertainties associated with federal support policies. Much of this growth can be attributed to the support received to date. Student interest remains strong and with the recent receipt of continuation support for the coming year, recruitment problems appear to have been overcome.

Frederick G. Pohland
Professor of Civil Engineering
Program Director

QUARTERLY PROGRESS REPORT (5 & 6)

Training Project Number T-900227

"Solid Waste Technology"

July 1, 1973 - December 31, 1973

Georgia Institute of Technology
Atlanta, Georgia

General

This report covers the fifth and sixth quarters of the extension of the project period which originally commenced July 1, 1972 at the beginning of the summer quarter at Georgia Tech. It coinsides with the summer and fall quarters covering a period of July through December.

Program Description

As detailed in the grant application, the program provides specialized training in the technology of solid waste characterization, collection, transport and disposal with special emphasis on pertinent operations and processes, systems analysis and management. The effort is accomplished by a flexible core curriculum in solid waste technology, by suggested graduate curricula in the contributing disciplines, and by seminars and field problems. Students enrolled in the program during this period have participated in courses in environmental chemistry and microbiology, public works planning and management and air pollution control. In addition, students participated in seminars and engaged in some special problem study.

Topics chosen by students participating in the program include:

"Sanitary Landfill Stabilization with Leachate Recycle and Residual Treatment" (Supported also by EPA Grant No. R-801397)

"Feasibility of Contained Stabilization of Compacted Refuse in Natural and Saline Environments" (Supported also by a Whirlpool Corporation Fellowship)

"A Survey of Solid Waste Collection and Management Practices at the Georgia Institute of Technology"

"Chemical Treatment of Leachate from Sanitary Landfills"

Trainee Participation and Accomplishments

The following trainees participated in the program during this report period:

Student	Degree-Date
William R. Bolton	MSSE - March 1974
Mark C. Boner	MSSE - March 1974
Charles N. Crandall	MSSE - Sept. 1974
Frank C. Mingledorff, Jr.	MSSE - Sept. 1973
Robert W. Olson	MSSE - Sept. 1974
Charles L. Simmons	MSSE - June 1974

Through their courses and special problem research, all trainees participate in solid waste laboratory and field projects. The normal student course load is 15 hours per quarter and most students extend their programs through 12 months.

The program director has been involved in several community and university projects including a Whirlpool project on landfill disposal and incineration of household compacted refuse, an EPA research grant on leachate recycle and treatment and on Environmental Engineering Committee (chairman) of the College of Engineering concerned with multidisciplinary training in environmental engineering specialties. Papers describing these efforts were presented at the APWA meeting in Denver in September, at the WPCF conference in Cleveland in October, and at a special seminar at the University of Florida in November. An additional presentation is scheduled at the AIChE meeting in Tulsa in March.

Administrative Actions

Staff assignments and activities associated with the training program in Solid Waste Technology have been consistent with the schedule described in the project proposal. Uncertainties associated with funding somewhat hindered student recruitment efforts and the procurement of additional staff participation. This has led to a search for other support and an anticipated increase in institutional commitment. Some success has been achieved by the continuation of a Whirlpool fellowship for a graduate student specializing in Solid Waste Technology. Other sources of support are being saught to augment support from EPA.

Plans for the coming quarter include current updating of the core courses in solid waste technology. Solid Waste Technology I will be broadened to permit participation of qualified undergraduates; Solid Waste Technology II will concentrate on graduate-level specialization.

The program at Georgia Tech has held its own despite the uncertainties associated with federal support policies. This strength is a direct consequence of previous EPA support. Student interest

remains strong and it is hoped that this interest may result in additional growth and contribution to the manpower needs of the field.

Frederick G. Pohland
Professor of Civil Engineering
Program Director

GEORGIA INSTITUTE OF TECHNOLOGY
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QUARTERLY PROGRESS REPORT No. 7

Training Project No. T-900227

"Solid Waste Technology"
January 1, 1974 through March 31, 1974

Georgia Institute of Technology
Atlanta, Georgia 30332

General

This report covers the seventh quarter of the extension of the project period which orginally commenced July 1, 1972 at the beginning of the summer quarter at Georgia Tech. It coincides with the winter quarter during which the first of two formal courses in solid waste technology is presented.

Program Description

As detailed in the grant application, the program provides opportunity for specialized training in the technology of solid waste characterization, collection, transport and disposal with special emphasis on pertinent operarions and processes, systems analysis and management. The effort is accomplished by a flexible core curriculum, by suggested adjunct courses, by seminars and by special projects. Students enrolled in the program during this period have participated in the first solid waste course and have embarked on the initial phases of their research.

Special research topics selected by students participating in the program include:

"Sanitary Landfill Stabilization with Leachate Recycle and Residual Treatment" (Supported also by EPA Grant No. R-801397).

"Feasibility of Contained Stabilization of Compacted Refuse in Natural and Saline Environments" (Supported also by a Whirlpool Corporation Fellowship).

"Treatment and Disposal of Solid Wastes from Poultry Hatcheries".

"Physical-Chemical Treatment of Leachate from Landfills".

"Anaerobic Stabilization of Solid Wastes from Produce Markets".

.../...

Quarterly Progree Report No. 7
Training Project No. T-900227
January 1, 1974 thrcugh March 31, 1974

Trainee Participation and Program Accomplishments

The following trainees participated in the program during this report period:

Student	Degree-Date
Mark C. Boner	MSSE - June 1974
Ralph R. Bouton	MSSE - Sept. 1974
Charles N. Crandall	MSSE - Sept. 1974
Edgardo N. Martinez	MSSE - Sept. 1974
Robert W. Olson	Terminated (Personal reason)
Charles L. Simmons	MSSE - June 1974

Through their courses and special problem research, all trainees participate in solid waste laboratory and field projects. The normal student course load is 15 hours per quarter and most students complete their programs in 12 months.

The program director has been involved in several solid waste oriented activities which, including progress on an EPA supported research project on leachate treatment and recycle, has resulted in the presentation of a paper on some of the research efforts at the AIChE meeting in Tulsa in March 1974 and additional reports scheduled for the ASCE Specialty Conference at Penn State in July 1974 and the International Conference on Water Pollution Research in Paris in September, 1974.

Administrative Actions

Staff assignments and activities associated with the training program in Solid Waste Technology have been consistent with the schedule described in the project proposal. The impending phase-out of EPA support has somewhat curtailed growth and has led to a search for additional mechanisms of support. The success of the program in the future will depend greatly upon the degree of interest maintained and manpower needs. The program at Georgia Tech has held its own despite these uncertainties which is directly accountable to the strong base provided with EPA support.

Frederick G. Pohland
Project Director

FGP:ja

QUARTERLY PROGRESS REPORT NO. 8

Training Project No. T-900227

"Solid Waste Technology"

April 1, 1974 through June 30, 1974

Georgia Institute of Technology

Atlanta, Georgia 30332

General

This report covers the eighth quarter of the extension period of the project originally commenced on July 1, 1972. It coincides with the spring quarter at Georgia Tech during which the second of two formal courses in solid waste technology was presented and the trainees initiated their special research projects.

Program Description

As detailed in the grant application, the program has been devised to provide opportunity for specialized training in the technology of solid waste characterization, collection, transport and disposal. The effort is accomplished with a flexible core curriculum complemented by adjunct courses, seminars and special problems. Students enrolled in the program have completed the formal courses and engaged in their research projects.

Special topics selected by students participating in the program include:

"Sanitary Landfill Stabilization with Leachate Recycle and Residual Treatment" (Supported also by EPA Grant No. R-801397).

"Stabilization of Compacted and Noncompacted Refuse in Natural and Saline Water Environments" (Supported also by a Whirlpool Corporation Fellowship).

"Biological Treatment of Solid Residues from Hatchery Operations"

"Separate Carbon Adsorption Treatment of Leachate"

"Use of Clays for Attenuation of Leachate Pollutants"

"Anaerobic Stabilization of Solid Wastes from Produce Markets"

"Feasibility and Acceptability of Waste Paper Recycle in Large Metropolitan Areas"

Trainee Participation and Program Accomplishments

The following trainees have participated in the program during this report period:

Student	Degree - Date
Mark C. Boner	MSSE - September 1974
Ralph R. Bouton	MSSE - September 1974
Charles N. Crandall	MSSE - September 1974
Edgardo N. Martinez	MSSE - September 1974
Charles L. Simmons	MSSE - September 1974

Through their courses and special problem research, all trainees participate in solid waste laboratory and field projects. The normal student course load is 15 hours per quarter and most students complete their programs in 12 months.

The program director has been involved in several solid waste oriented activities which, including progress on an EPA supported research project on leachate treatment and recycle and assisting EPA on a position paper, has resulted in a presentation at the ASCE Specialty Conference at Penn State and a scheduled presentation at the International Conference on Water Pollution Research in Paris in September, 1974.

Administrative Actions

The program has continued to provide graduates who are functional in the solid waste management area. However, the phase-out of EPA support will probably adversely effect the productivity unless other avenues and sources of support can be developed. Such sources are presently being sought with some limited success to date. With the previous support of EPA, the program at Georgia Tech has developed a strong base which hopefully serve to advantage in the future.

Frederick Pohland
Project Director

QUARTERLY PROGRESS REPORT No. 9

Training Project No. T-900227

"Solid Waste Technology"

July 1, 1974 through September 30, 1974

Georgia Institute of Technology

Atlanta, Georgia 30332

General

This report covers the ninth quarter of the extension period of the project which originally commenced on July 1, 1972. It coincides primarily with the summer quarter at Georgia Tech during which most of the students were engaged in special problem research and the completion of their graduate programs. It also includes several weeks of the 1974-75 academic year.

Program Description

As detailed in the grant application, the program has been devised to provide opportunity for specialized training in the technology of solid waste characterization, collection, transport and disposal. The effort is accomplished with a flexible core curriculum complemented by adjunct courses, seminars and special problems.

During the past quarter, several research efforts have been finished and several others are being completed. These projects have included the following:

"Sanitary Landfill Stabilization with Leachate Recycle and Residual Treatment" (supported also by EPA Grant No. R-801397).

"Stabilization of Compacted and Noncompated Refuse in Natural Water and Saline Water Environment" (Supported also by a Whirlpool Corporation Fellowship.

"Treatability of Chicken Hatchery Wastes"

"Carbon Treatment of Leachate"

"Use of Clays for Attenuation of Leachate Pollutants"

"Anaerobic Stabilization of Solids Waste from Produce Markets"

"Feasibility and Acceptability of Waste Paper Recycle in Large Metropolitan Areas"

Because the new school year has recently commenced, no new projects have yet been initiated and students are presently engaged in consideration of appropriate research subjects.

Trainee Participation and Program Accomplishments

The following trainees have participated in the program during this report period:

Student	Degree-Date
Mark C. Boner	MSSE - December 1974
Ralph R. Bouton	MSSE - September 1974
Charles N. Crandall	MSSE - September 1974
Michael A. Daigle	MSSE - September 1975
Edgardo N. Martinez	MSSE - September 1974
Thomas E. Plouff	MSSE - September 1975
Charles L. Simmons	MSSE - September 1974

Through their courses and special problem research, all trainees participated in solid waste laboratory and field projects. The normal student course load is 15 hours per quarter and most students complete their programs in 12 months.

The program director has been involved in several solid waste oriented activities which, including progress on an EPA-supported research project on leachate treatment and recycle, has resulted in several technical presentations including a most recent participation at the International Conference on Water Pollution Research in Paris in September, 1974.

Administrative Actions

The program continues to provide a focus on solid waste management within Sanitary Engineering at Georgia Tech and has produced graduates who are in demand and functional in the field. With the phase-out of EPA support, continuing efforts are being made to find other support mechanisms in an attempt to safeguard and develop upon the strong educational base provided by EPA through its training grant.

Frederick G. Pohland
Project Director

QUARTERLY PROGRESS REPORT NOS. 10 & 11

"Solid Waste Technology"
October 1, 1974 through March 31, 1975
Georgia Institute of Technology
Atlanta, Georgia 30332

General

This report covers the ninth and tenth quarter of the extension period of the project which originally commenced on July 1, 1972. It coincides essentially with the fall and winter quarters at Georgia Tech during which students were beginning their graduate programs and developing research alternatives.

Program Description

As detailed in the grant application, the program has been developed to provide specialized training in the technology of solid waste characterization, collection, transport and disposal. The effort is accomplished with a flexible core curriculum complemented by adjunct courses, seminars and special problems.

During this report period, a research report on "Sanitary Landfill Stabilization with Leachate Recycle and Residual Treatment" (also supported under EPA Grant No. R-801397) was completed and submitted for review. In addition, a report on the "Feasibility and Acceptability of Waste Paper Recycle in Large Metropolitan Areas" is being completed and special projects on the "Treatment of Animal Wastes for Energy Recovery" and "Attenuation of Waste Oils during Landfill Disposal" have been initiated by participating trainees. All available reports of past projects were also submitted to the sponsoring agency during this period.

Trainee Participation and Program Accomplishments

The following trainees participated in the program during this report period:

Student	Degree-Date
Marc C. Boner	MSSE-June 1975
Michael A. Daigle	MSSE-September 1975
Thomas E. Plouff	MSSE-September 1975
Harold L. Newberry	MSSE-September 1975

Through their courses and special problem research activities, all trainees participated in the solid waste course and laboratory and a total of 15 students were enrolled in the first formal course in solid waste technology during the winter quarter. The second formal course in solid waste technology will be offered during the spring quarter.

The program director has been involved in several solid waste oriented activities which, including progress on an EPA-supported research project on leachate treatment and recycle, has resulted in several technical presentations including conferences in Madison, Wisconsin in January 1975 and in New Brunswick, N. J. in March 1975.

Administrative Actions

In spite of the impending phase-out of EPA support for graduate training, the program continues to focus on solid waste management within Sanitary Engineering at Georgia Tech and has produced graduates who are in demand and functional in the field. Present administrative efforts are being directed toward development of support mechanisms which will assure the continuation of the effort initiated through the EPA training grant.

Frederick G. Pohland
Professor of Civil Engineering
Project Director

QUARTERLY PROGRESS REPORT NOS. 12 & 13

"Solid Waste Technology"
April 1, 1975 through September 30, 1975
Georgia Institute of Technology
Atlanta, Georgia 30332

General

This report covers the indicated period of the project extension originally commencing on July 1, 1972. It coincides essentially with the spring and summer quarter at Georgia Tech during which time past trainees were completing their programs and research reports.

Program Description

As detailed in the grant application, the program has developed specialized training in the technology of solid waste characterization, collection, transport and disposal as well as a consideration of regulatory and monitoring requirements. The effort is accomplished with a core curriculum in Sanitary Engineering complemented by adjunct courses, seminars and special problems.

During this report period, a research report on "Sanitary Landfill Stabilization with Leachate Recycle and Residual Treatment" (also supported under EPA Grant No. R-801397) was revised for publication and a new extension of the project was approved. This extension will permit participation of solid waste trainees in this research area. In addition, reports on a "Questionnaire Survey of Atlanta Metropolitan Region to Determine Feasibility of Programs for Wastepaper Separation and Recycling in the Residential Area" and "A Field Evaluation of an Anaerobic Digestion System for the Treatment of Hog Manure" were completed. Additional reports on "Stabilization and Leachate Production of a Metal Finishing Sludge Conditioned with Portland Cement" and "Attenuation of Waste Oils during Landfill Disposal" are being completed in association with the training effort. These reports will be submitted to the sponsoring agency when available.

Trainee Participation and Program Accomplishments

The following trainees participated in the program during this report period:

Student	Degree - Date
Marc C. Boner	MSSE - June 1975
Michael A. Daigle	MSSE - December 1975
Thomas E. Plouff	MSSE - December 1975
Harold L. Newberry	MSSE - December 1975

In addition, Mr. James C. Strait, Jr. has been appointed to commence his program in the fall quarter, 1975. Through their courses and special problem research, all trainees have or are scheduled to participate in the solid waste

courses and laboratory acitvities. During this report period, 10 students enrolled in the second formal course in Solid Waste Technology.

The program director has been involved in several solid waste oriented activities including research on leachate treatment and recycle as well as specialty conferences. Participation as a panel member at the EPA/NSWMA Conference in Atlanta is scheduled for November 1975.

Administrative Actions

In spite of the phase-out of EPA support for graduate training, a viable focus on Solid Waste Technology within Sanitary Engineering at Georgia Tech has been maintained. Graduates from the program have been successful in obtaining employment and are functionally competitive with other professionals. Present administrative efforts are being directed at preserving this viability and building on the basis developed through EPA support.

Frederick G. Pohland
Professor of Civil Engineering
Program Director

E-20-514

QUARTERLY PROGRESS REPORT NO. 14

"Solid Waste Technology"
October 1, 1975 through December 31, 1975
Georgia Institute of Technology
Atlanta, Georgia 30332

General

This report covers the indicated period of the project originally commenced on July 1, 1972. It coincides essentially with the fall quarter at Georgia Tech during which two trainees completed their studies and one new trainee was appointed.

Program Description

As detailed in the grant application, the program has developed specialized training in the technology of solid waste characterization, collection, transport and disposal as well as considerations of regulatory and monitoring requirements and opportunities for reclamation and recycle. The effort is accomplished with a core curriculum in Sanitary Engineering complemented by adjunct courses, seminars, research and special problem efforts.

During this report period, a research report on "Sanitary Landfill Stabilization with Leachate Recycle and Residual Treatment" was published by EPA as part of their Environmental Protection Technology Series (EPA-600/2-75-043, October 1975). Efforts are proceeding on an extension of this work which will permit trainees and other students to participate in this research area. In addition, reports on "Questionnaire Survey of Atlanta Metropolitan Region to Determine Feasibility of Programs for Wastepaper Separation and Recycling in the Residential Sector" and "A Field Evaluation of An Anaerobic Digestion System for the Treatment of Hog Manure" were published. Further effort is also being expended to complete reports on "Stabilization and Leachate Production of a Metal Finishing Sludge" and "Attenuation of Waste Oils during Landfill Disposal." As the students' programs proceed, it is likely that other solid waste management projects will materialize.

Trainee Participation and Program Accomplishments

The following trainees participated in the program during this report period:

Student	Degree-Date
Mark C. Boner	MSSE-December 1975
Michael A. Daigle	MSSE-December 1975
Thomas E. Plouff	MSSE-December 1975
Harold L. Newberry	MSSE-March 1976
James C. Strait, Jr.	MSSE-August 1976

Through their courses and special problem or research activities, all trainees have or are scheduled to participate in the solid waste courses and

laboratory activities. In addition, a total of 15 students have enrolled in the first formal course in Solid Waste Technology as a direct result of the training activities.

The program director has continued his efforts and initiated new research on solid waste management during this report period. Participation as a panel member at an EPA/NSWMA Conference in November 1975 and serving as a technical consultant to these organizations have also highlighted the program director's activities in the field of solid waste management.

Administrative Actions

Impending phase-out of the EPA support for graduate training in solid waste management continues to impact on our planning and development for the future. Student recruitment has been adversely influenced since other training funds are still available. However, every effort is being made to maintain a viable emphasis in solid waste technology within the Sanitary Engineering program at Georgia Tech. Graduates from the program continue to be in demand and no diminution of such manpower needs are anticipated for the foreseeable future.

Frederick G. Pohland
Program Director
Professor of Civil Engineering

QUARTERLY PROGRESS REPORT NO. 15

"Solid Waste Technology"
January 1, 1976 through March 31, 1976
Georgia Institute of Technology
Atlanta, Georgia 30332

General

This report covers the indicated quarterly project period of the training grant originally commenced on July 1, 1972. It coincides essentially with the winter quarter at Georgia Tech during which one student trainee was supported.

Program Description

As detailed in the original grant application, the program in Solid Waste Technology has been developed to offer specialized training in solid waste management including emphasis on solid waste characterization, collection, transport and disposal as well as consideration of regulatory and monitoring requirements and opportunities for reclamation and recycle. The effort is accomplished with a core curriculum in Sanitary Engineering complemented by adjunct courses, seminars, research and special problem efforts.

Trainee Participation and Program Accomplishments

During this report period, the first of a sequence of two graduate level solid waste technology courses was offered with an enrollment of 16 students. Continuation work on "Controlled Landfill Stabilization by Leachate Recycle" (EPA Grant R 803 953-01) has also been initiated to include student participation and a special problem effort on management of hazardous solid wastes by landfill disposal is being developed by the one trainee supported during this period, Mr. James C. Strait, Jr.

The program director continues to be responsible for the solid waste research emphasis within the Sanitary Engineering program. He has also participated in a technical session on "Gas and Leachate Generation and Control in Landfills" at the University of Wisconsin in March 1976 and is planning to assist in a "Regional Solid Waste Management Workshop" being scheduled with EPA support in Florida during May 1976.

Administrative Actions

The impending phase-out and expiration of grant support in Solid Waste Technology has resulted in a decline in student interest and activity. To maintain a viable solid waste management emphasis, every effort is being made to secure other sources of funding. The lack of professional identity remains a problem requiring continuing attention and which has been accomodated in part by parallel training for students in Sanitary Engineering. However, the solid waste specialty remains a marketable commodity for graduates from the program, a factor which is being used to promote student interest.

E-20-519
Final

GEORGIA INSTITUTE OF TECHNOLOGY
ATLANTA, GEORGIA 30332

SCHOOL OF
CIVIL ENGINEERING

TELEPHONE:
(404) 894-2265

July 28, 1976

Mr. Ralph J. Black, Director
Regional, State and Local Affairs Staff
Office of Air and Waste Management
U. S. Environmental Protection Agency
Washington, D. C. 20460

Re: Grant No. T-900227

Dear Ralph:

Enclosed herewith are three copies of our final report on training grant T-900227, "Solid Waste Technology" covering the period July 1, 1972 through June 30, 1976. I trust this report will be satisfactory and will provide you with a sufficient review of program activities and accomplishments during the project period.

By copy of this letter, I am also requesting that our Office of Research Administration provide you the necessary inventory of equipment purchased under the grant together with a request to have ownership transferred for continued use in our training efforts at Georgia Tech as appropriate.

We certainly have appreciated the support provided to our program and would like the opportunity to explore the continuation of such an association when possible in the future. Many thanks for your interest and the European contacts, I intend to visit several of these during my stay in the Netherlands.

Best personal regards.

Sincerely,

Frederick G. Pohland
Professor of Civil Engineering
Project Director

FGP:jp
cc: Dr. J. E. Fitzgerald
Office of Research Administration

Final Report

SOLID WASTE TECHNOLOGY

By:

Frederick G. Pohland, Project Director
School of Civil Engineering
Georgia Institute of Technology
Atlanta, Georgia 30332

EPA Grant No. T-900227
GIT Project No. E-20-519

Project Officer:

Mr. Ralph J. Black, Director
Regional, State and Local Affairs Staff
Office of Air and Waste Management
U. S. Environmental Protection Agency
Washington, D. C. 20460

Prepared for:

Office of Air and Waste Management
U. S. Environmental Protection Agency
Washington, D. C. 20460

July 28, 1976

Introduction

This report includes a final documentation of activities associated with the subject training grant in Solid Waste Technology which was initiated on July 1, 1972 and extended through June 30, 1976. The extension of the grant from its original project period of one year permitted a continuation of the training effort but at a much reduced level of support. This continuation was requested to help stimulate the emphasis in solid waste technology within the Sanitary Engineering program at the Georgia Institute of Technology as long as funding prevailed and until eventual phase-out of EPA support of university training in this and other environmental areas.

General Perspective

As originally conceived, the training program in Solid Waste Technology was initiated to provide specialized interdisciplinary graduate level training in the technology of solid waste characterization, collection, transport and disposal with special emphasis on pertinent unit operations and processes, systems analysis and optimization, economics and financing, design, and overall program management within the public and private sectors. The training effort was keyed upon a flexible core curriculum in solid waste technology within the contributing disciplines and supported by seminars, field problems and special research projects.

Depending upon the selected discipline, a student participating on the training program as a trainee normally developed a curriculum of graduate level courses which extended over a 12-month period and which contained a minimum of 50 quarter hours of credit including a special research problem. Successful completion of the curriculum resulted in the award of a Master of Science degree either undesignated or designated in a specified professional discipline. Most frequently this process also resulted in the publication of a research report either separately or in combination with other efforts.

Program Curriculum

As indicated previously, student curricula were developed with a core of courses which normally included the following or appropriate substitutes:

CE 4133	Engineering Aspects of Environmental Health	3-0-3
CE 4774	Applications of Microbiology in Sanitary Engineering	3-3-4

CE 6124	Air Pollution Measurements and Control	3-1--
CE 6118	Solid Waste Technology I	2-1-3
CE 6128	Solid Waste Technology II	2-1-3
CE 6353	Economic and Financial Aspects of Public Works Planning	3-1-3
CE 8001	Seminar in Sanitary Engineering	0-2-1
CE 8756	Special Research Problem	- - 6
	Total Core Credit Hours	27

In support of the core courses, certain prerequisites and alternatives were employed by trainees including emphasis on systems engineering, computer applications and planning. Both the core and supporting courses were administered by the participating disciplines with the major activity within Civil Engineering (CE) but with additional input from Industrial and Systems Engineering (ISyE) and City Planning (CP). Therefore, superimposed on the core requirement were the degree requirements of the elected disciplines. As an example, the usual degree was a designated graduate M.S. degree in Sanitary Engineering (MSSE); a typical program with a solid waste specialty leading to the award of this degree within a projected 12-month period has been included in Table 1.

Program Accomplishments

Student Participation - During the project period, a total of 17 trainees were supported on the program with an additional number of other students participating in the solid waste courses and research efforts. Normally the two-course sequence in Solid Waste Technology (CE 6118 and CE 6128) attracted a total of between 15 and 20 students each time they were presented. Consequently, students other than trainees selected solid waste technology as a minor specialty area as was also reflected by their research participation and emphasis.

Information pertinent to the identification of graduate students participating as trainees in the Solid Waste Technology program is included in Table 2. The normal period required for students to complete their academic program was 12 months although completion of special problem research projects or additional course work occasionally extended this period. However, the usual support period was 12 months or less.

In addition to the project reports listed in Table 2, student participation also resulted in several other documents, some of which were associated with

Table 1

Typical MSSE Degree Program with a Specialty
in Solid Waste Technology

Fall Quarter

CE 4774	Applications of Microbiology in Sanitary Engineering	3-3-4
CE 6139	Applications of Chemistry in Sanitary Engineering	3-3-4
CE 6124	Air Pollution Measurement and Control	3-3-4
CE 6353	Economic and Financial Aspects of Public Works Planning	3-0-3
		15 hours

Winter Quarter

CE 4133	Engineering Aspects of Environmental Health	3-0-3
CE 4143	Man in His Environment	3-0-3
CE 6108	Applications of Instrumental Analysis in Sanitary Engineering	2-3-3
CE 6118	Solid Waste Technology I	2-3-3
CE 6144	Sanitary Engineering Processes I	3-3-4
		16 hours

Spring Quarter

CE 6113	Industrial Wastes Treatment and Disposal	2-3-3
CE 6128	Solid Waste Technology II	2-3-3
CE 6149	Sanitary Engineering Processes II	3-3-4
CE 8756	Special Research Problem	- -3
CE 8001	Seminar in Sanitary Engineering	0-2-1
		14 hours

Summer Quarter

CE 6145	Field Methods in Sanitary Engineering	0-15-5
ISyE 6739	Experimental Statistics	4-0-4
CE 8756	Special Research Problem	- -3
		12 hours

Table 2

Solid Waste Technology Trainee Information

Name	Degree-Date	Project Title	Employer*
John F. Madajewski	MSSE-Sept. 1972	"The Effect of Household Compacted Refuse on Solid Waste Disposal Practices"	Disko Associates West Orange, N.J.
Larry J. Picciola	MSSE-Sept. 1972	"Feasibility of Developing Sanitary Landfills at Abandoned Surface Mines in Georgia"	Picciola & Associates Gaillans, La.
John R. Rist	MSSE-Sept. 1972	"Solid Waste Management Alternatives on Indian Reservations"	State of Georgia Environmental Protection Division Atlanta, Ga.
Charles R. Breland	MSSE-Dec. 1972	"Landfill Stabilization with Leachate Recirculation, Neutralization, and Sludge Seeding"	State of Georgia Environmental Protection Division Atlanta, Ga.
Gary L. Sweenhart	MSSE-Dec. 1972	"Anaerobic Treatment of Livestock Waste"	William Mattatan & Associates Albuquerque, N.M.
Frank C. Mingledorff, Jr.	MSSE-Sept. 1973	"Preliminary Investigations on the Chemical Treatment of Leachate from Sanitary Landfills"	Environmental Protection Agency Atlanta, Ga.
William R. Bolton	MSSE-Sept. 1974	"Feasibility of Contained Stabilization of Compacted Refuse in Natural and Saline Environments"	Southern Services, Inc. Atlanta, Ga.
Charles N. Crandall	MSSE-Sept. 1974	"Removal of Calcium from Leachate by Kaolin Clay"	Black, Crow & Eidsness Gainesville, Fla.

Table 2 (Continued)

Name	Degree-Date	Project Title	Employer*
Charles L. Simmons	MSSE-Sept. 1974	"Sanitary Landfill Design with Leachate Recycle and Residual Treatment"	Graduate Student Louisiana State University, New Orleans, La.
Ralph R. Boulon	MSSE-Sept. 1974	"Treatment of Leachate with Activated Carbon"	J. R. Sirrine, Inc. Greenville, S.C.
Edgardo N. Martinez	MSSE-Sept. 1974	"Anaerobic Digestion of Some Produce Market Wastes"	Black, Crow & Eidsness, Inc San Juan, Puerto Rico
Michael A. Daigle	MSSE-Dec. 1975	"A Field Evaluation of an Anaerobic Digestion System for the Treatment of Hog Manure"	Oxidental Chemical Co. White Springs, Fla.
Thomas E. Plouff	MSSE-Dec. 1975	"A Field Evaluation of an Anaerobic Digestion System for the Treatment of Hog Manure"	Environmental Protection Agency, Atlanta, Ga.
Mark C. Boner	MSSE-Dec. 1975	"Questionnaire Survey of Atlanta Metropolitan Region to Determine the Feasibility of Programs for Wastepaper Separation and Recycling in the Residential Sector"	Evans, Leopold & Zimmerman Atlanta, Ga.
Harold L. Newberry	MSSE-Dec. 1976	"Use of Waste Materials for Co-Disposal of Waste Oil in Sanitary Landfills"	Tribble & Richardson, Inc. Macon, Ga.
James C. Strait	MSSE-Dec. 1976	"Landfill Disposal of Hazardous Wastes"	--
Michael Hom	MSSE-June 1977	--	--

*Current or last known employer.

separate research and study activities. Foremost among these efforts was the research studies on leachate characterization and treatment from which the prime publication appeared in the EPA Environmental Protection Technology Series (EPA-600/2-75-043, October 1975), "Sanitary Landfill Stabilization with Leachate Recycle and Residual Treatment." Complementary research and study reports included:

"A Survey of Solid Waste Collection and Management Practices at the Georgia Institute of Technology" Alvin C. Firmin, March 1973

"Stabilization and Leachate Production of a Metal Finishing Sludge Conditioned with Portland Cement" W. Kirk Milam, January 1976

"A Review of State Rules and Regulations to Sanitary Landfill Operation and Control" (In preparation)

Staff Participation - The participating staff throughout this project period have been identified with either the course offerings or laboratory or field research and study activities. The Sanitary Engineering faculty accounted for the primary involvement with the program director being responsible for trainee participation as academic and research advisor. In addition to teaching contact, other faculty and special lecturers were involved with the promulgation of research, seminars and field projects.

Beyond the normal responsibilities associated with administration of the training program, the program director has been active in several community projects including development and review of the new solid waste regulations for the State of Georgia (Rules and Regulations for Solid Waste Management, October 1974), a solid waste ad hoc committee of Engineers Concerned for Quality Environment Council, the EPA-Whirlpool-State of Georgia demonstration project on the household compactor (The Atlanta Household Refuse Compactor Demonstration Project, Final Report, 1973) and a companion investigation on landfill disposal and incineration of household compacted refuse. In addition, the project director was recipient of an initial and a new continuation grant for research on landfill stabilization with leachate capture and recycle (EPA R-801397 and R-80395).

The preceding efforts resulted in several presentations at seminars and technical conferences including the Third Environmental Engineering and Science Conference (Louisville, Ky., March 1973), the Water Pollution Control Federation Conference (Cleveland, Ohio, October 1973), the University of Florida Seminar Series (Gainesville, Fla., November 1973), the American

Institute of Chemical Engineers Conference (Tulsa, Okla., March 1974), the American Society of Civil Engineers Specialty Conference (Penn State, July 1974), the International Conference on Water Pollution Research (Paris, France, September 1974), the Workshop on Landfill Leachate (Madison, Wis., January 1975), the Research Symposium on Gas and Leachate from Landfills (New Brunswick, N.J., March 1975), the National Solid Waste Management Association Conference (Atlanta, Ga, November 1975) and the Conference on Gas and Leachate Generation and Control in Landfills (Madison, Wis., March 1976).

In addition to the aforementioned reports, participation in the preceding events led to several separate publications including:

Pohland, F. G. and Maye, P. R., "Landfill Stabilization with Leachate Recycle," Proc. 3rd Environmental Engineering and Science Conference, University of Louisville, 389 (1973).

Pohland, F. G., "Sanitary Landfill Stabilization with Leachate Recycle and Residual Treatment," Water-1974, Amer. Inst. of Chemical Engineers, Symp. Ser., 145, 71, 303 (1975).

Pohland, F. G., "Accelerated Solid Waste Stabilization and Leachate Treatment by Leachate Recycle Through Sanitary Landfills," Progress in Water Technology, 7, 3/4, 753 (1975).

Pohland, F. G., "Landfill Management with Leachate Recycle and Treatment: An Overview," In "Gas and Leachate from Landfills - Formation, Collection and Treatment," Genetelli, E. J. and Cirello, J. [Eds.], Symposium Proc., EPA-600/9-76-004, March 1976.

All of these publications have been made available for distribution.

Related Activities - The student and staff activities were routinely complemented by participation of guest lecturers in seminars and special laboratory sessions. These were normally used to fortify the formal course presentations as well as to assist in special topic areas. Representative subjects included:

"Solid Waste Management and Organizational Structure at the Federal, State and Local Levels"

"Equipment Identification, Selection and Maintenance for Solid Waste Management Operations"

"Legal Ramifications of Regulations Governing Solid Waste Management Practicies"

"Incinerator Design and Operation"

"Landfill Design, Operation and Control"

"Monitoring Requirements for Solid Waste Management Systems"

"Financing Solid Waste Management Systems"

"Routing Procedures for Solid Waste Collection Systems"

Although attended primarily by students and faculty, these special lectures were open for any interest group. They were particularly valuable because they normally provided for varying viewpoints and also made available specialized literature and reference materials.

Synopsis

It is doubtful whether the specialty emphasis in Solid Waste Technology could have been developed to its present position within the Sanitary Engineering program at the Georgia Institute of Technology without the generous support provided by the EPA training grant. The seed moneys made available for personnel, supplies and equipment, and trainees throughout its existence have resulted in a recognized productivity far surpassing original expectations.

The solid waste technology thrust now exists as a real and viable ingredient within the graduate program which, with the phase-out of EPA support, has continued to receive encouragement and support commensurate with need and availability from the institute. Graduates from the program have been highly successful in attaining employment partially due to the added credential in the solid waste specialty which has favorably impacted on their competitive posture in the marketplace. These graduates have been highly functional in environmental engineering and have assumed positions of responsibility and authority.

Whether solid waste technology or some other professional designation will survive as a separate entity in the academic arena may well be a function of availability of financial support for students either through training programs or research. If other environmental areas, i.e. water and/or air, should receive such support in the future without a similar availability to the solid waste emphasis, they would have an extreme advantage in attracting students and stimulating research activities. It is therefore considered particularly crucial for the solid waste emphasis to be included in such support programs especially when professional manpower training is involved. Based upon the achievement record of this program and others like it, some type of future academic support from EPA should be a necessary consideration since the future bodes a real need which satisfied could yield exceptional returns on the investment.